MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

ECT2036 – CIRCUITS AND SIGNALS

(All sections / Groups)

15 OCTOBER 2015
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages including cover page with 4 Questions only.
2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Only the textbook is allowed to be brought in during the exam.

Question 1

a) i. Draw a suitable graph (with tree and cotree) for the network shown in Figure Q1(a) and number each of the branch. [4 marks]

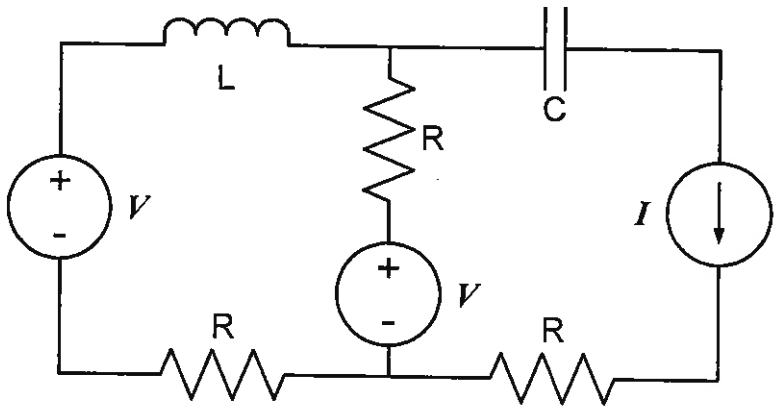

Figure Q1(a)

ii. Determine the fundamental cutset matrix, C*i* = 0 in matrix form. [4 marks]

iii. Determine the fundamental loop matrix, D*e* = 0 in matrix form. [4 marks]

b) Plot the function $f(t)=3u(t)+tu(t)-[t-1]u(t-1)-5u(t-2)$ [4 marks]

c) Perform the convolution of the two signals shown in Figure Q1(b). [9 marks]

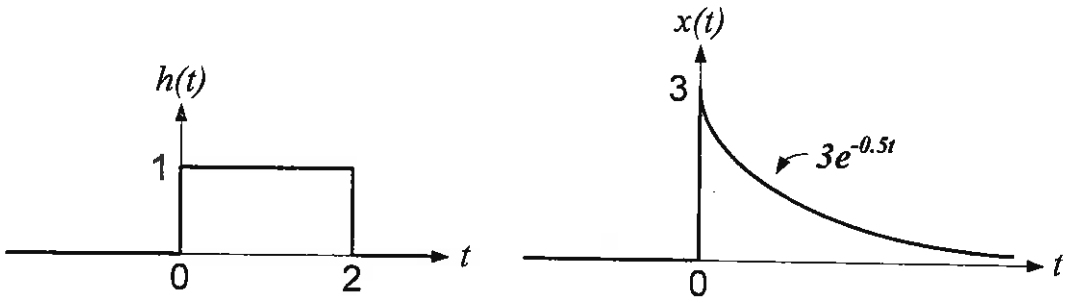

Figure Q1(b)

Continued...

Question 2

a) Obtain the inverse Laplace transform of $F(s)=\frac{8(s+1)}{s^2(s+2)}$ [6 marks]

b) Write the *time domain integro-differential* equation for the circuit in Figure Q2. Draw the frequency domain equivalent circuit and determine the current, *i(t)* that flows in the circuit.
Given that $v = 10$V and assume that steady-state condition is reached when switching.

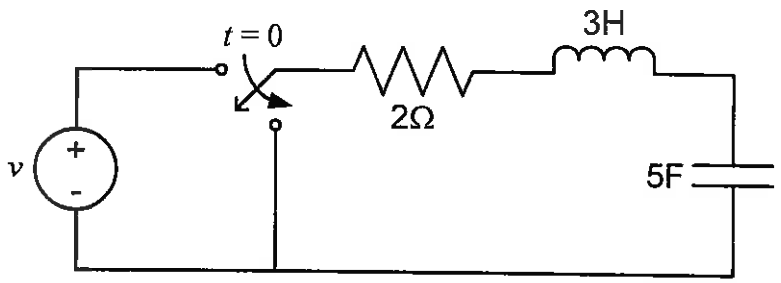

Figure Q2

[3+4+12 marks]

Continued...

Question 3

a) Determine the *transmission parameters* for the two-port network in Figure Q3(a) below.

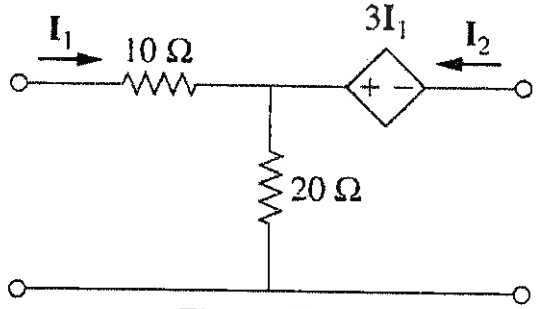

Figure Q3(a)

[13 marks]

b) Determine the *state-space representation* of the circuit in Figure Q3(b), given that v_o and i_o are the output variables.

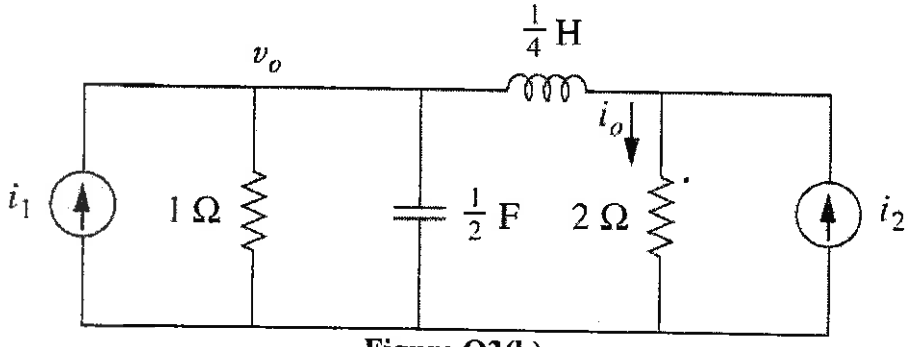

Figure Q3(b)

[12 marks]

Continued...

Question 4

a) Apply the Hurwitz polynomial properties to determine whether or not the polynomial $P(s)$ is Hurwitz. [5 marks]

$$P(s) = 3s^5 + 4s^4 + 2s^3 + 3s^2 + s + 1$$

b) Realize the network $Z(s)$ given below by using Foster 1st method. [8 marks]

$$Z(s) = \frac{s(s^2+3)}{(s^2+2)}$$

c) Determine the attenuation at f = 6 kHz of a 5th order Butterworth filter which 1 dB pass band edge is located at 2 kHz. [6 marks]

d) Determine the order of a low-pass filter which is known to have maximum allowable pass band attenuation and limiting frequency of 5dB and 400 rad/s, and a minimum stop band attenuation and edge frequency of 15dB and 800 rad/s, respectively. [6 marks]

End of paper.